

## CHEMICAL COMPOSITION OF KID MEAT OF THE DOMESTIC WHITE GOAT

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*The paper presents some investigations on several nutritive characteristics of kid meat.*

*Kids of the domestic white goat were used. The experimental animals (two groups) were slaughtered at the age of 3,5 to 4 months. The animals of the first group (n=20) were reared on private holdings. The kids were suckling up to three months, with access to grass and periodically were given meadow hay and ground maize. The second group (n=20) was reared on a large farm. The kids were suckling for 20 days, and then accustomed to the concentrate system of feeding. The second group of animals were offered a mixture of ground maize, barley meal, sunflowerseed meal, "Kostovit" (mineral additive) and "Premix" together with meadow hay. Both groups received salt ad lib.*

*The chemical composition, and the amino-acid composition, as well as the content of macro (Ca, P, K, Na) and trace elements (Fe, Zn, Cu, Mn and Mg) were determined in samples of Musculus longissimus dorsi of the kids.*

*The results of the analyses confirmed that the nutritive quality of the meat is high. The content of protein was 20,94 to 21,70%. Moreover, the contents of iron (18 to 20,20 mg kg<sup>-1</sup>) and phosphorus (19 to 23 mg kg<sup>-1</sup>) were very favourable. The kid meat contained a very small amount of fat (0,54 to 1,01%).*

*Key words: kids, meat, chemical composition, amino acid composition, trace and macro elements.*

## INTRODUCTION

Meat quality is the subject of numerous scientific investigations (Hofmann, 1986; Prändl, 1973; Kramer, 1966; Joksimović, 1977; Popov-Raljić et al., 1994).

Two approaches are crucial for the determination of quality: the definition of parameters representing certain quality characteristics and quantitative expression of the characteristics in terms of overall quality. Generally, assessment

of meat quality includes hygienic-toxicologic, nutritive, sensory and technological factors.

Many complex factors influence the chemical composition of meat, such as: kind of animal, breed, age, sex, nutrition, physical fatigue before slaughter, state of health etc. (Rahelić, 1978; Nünivaara, 1969; Krilova and Ljaskovskaja, 1968; Lushbough and Schweigert, 1960; Ridel, 1984; Litovčenko and Esaulova, 1972; Kelemen-Mašić, 1991; Krajinović and Savić, 1992; Popov-Raljić et al., 1994).

Riedel (1984) reported that lamb meat with high protein (18,00%) and low fat (16,00%) content is a high-quality foodstuff according to the modern nutrition requirement of "less fat, more protein".

The chemical composition and the nutritive value of the meat depend on the fattening level of the animal (Mitić, 1984). Litovčenko and Esaulova (1972) report that at fattening level "lean" the lamb leg muscle contains 9,0% of fat, while at the "fat" level it contains 22,0% of fat.

Karan-Đurđić (1980) presented the amino acid composition of proteins of mutton, bee and pork, and reported no significant difference in the percentage ratio of certain amino acids in the proteins of these animals. Thus, the content of methionine was 2,3% in the protein of sheep and cattle and 2,5% in the proteins of pigs. Lysine is present at 7,6% for sheep, 8,4% for cattle and 7,5% for pigs.

Comparing the content of trace elements of meat and other foodstuffs, Rogowski (1981) points to the high iron content in the meat and organs. According to this author, mutton contains 2000  $\mu\text{g}/100\text{ g}$  of iron (Fe) and 5000  $\mu\text{g}/100\text{ g}$  of zinc (Zn). However, it has been shown that mutton contains only 20  $\mu\text{g}/100\text{ g}$  of selenium (Se).

Having in mind the importance of the mentioned facts, the aim of this work was to investigate certain nutritive characteristics of kid meat of the domestic white goat, reared in individual and cooperative sectors.

#### MATERIAL AND METHODS

Domestic white goat kids were slaughtered at the age of 3,5 to 4 months. The first experimental group ( $n=20$ ) was reared in backyards on private holdings. The kids were suckling up to three months, with access to grass and periodical addition of meadow hay and ground maize. The average body weight amounted to 12,2 to 17,0 kg. The second experimental group ( $n=20$ ) was reared on a large farm. The kids of that group were suckling up to 20 days and became accustomed to the concentrate system of feeding. The ration of that group consisted of ground maize, barley meal, sunflowerseed meal, "Kostovit" (mineral additive) and "Premix". Besides concentrate feed, the kids were also offered meadow hay. The average body weight was 14,5 to 17,0 kg. Both groups obtained salt ad lib.

After slaughter and dressing of the carcass, samples of *Musculus longissimus dorsi* (MLD) were taken without the adjacent fatty tissue and fascies and well homogenized in a mixer. The investigations included the determination of basic chemical composition, amino acid composition and content of trace and macro-minerals in the MLD of kids.

The content of dry matter, crude protein, fat and total mineral matter was determined according to AOAC methods (1980).

The amino acid composition of proteins was determined by ion exchange chromatography using HPLC and the aminoanalyser "Biotronik" model LC-3000 according to the method given by Spackman et al., (1958).

The content of potassium, calcium, sodium and phosphorus in the mineralized sample was determined by means of flame spectrophotometry (Ewans Electronic).

The iron, zinc, copper, manganese and magnesium were determined by atomic absorption spectrophotometry using a UNICAM SP 90B atomic absorber.

## RESULTS AND DISCUSSION

The basic chemical composition (content of water, protein, fat and ash) in the samples of MLD of kids reared in backyards (group I) and on the farm (group II) is presented in Table 1.

Table 1. Basic chemical composition of musculus longissimus dorsi of kids as %

Content	Group					
	I (n = 20)			II (n = 20)		
	$\bar{x}$	S	V	$\bar{x}$	S	V
Water	76,29	1,43	1,88	75,78	0,59	0,77
Proteins	20,94	0,74	3,55	21,71	0,31	1,45
Fat	0,54	0,44	81,11	1,01	0,36	35,95
Ash	0,90	0,17	19,30	1,07	0,09	8,75

Group I - backyard system of rearing kids (n=20)

Group II - kids reared on the farm (n= 20)

$\bar{X}$  - mean value of the content determined

S - standard deviation

V - coefficient of variation

Statistical processing of the results obtained (Wolfe and Koelling, 1984) indicated no significant differences with respect to content of water, protein, fat and ash between the groups investigated. The mean values for the content of water, protein, fat and ash are in agreement with those obtained for commercial cuts from kids of a Spanish breed of goat (Murciana-Granadina) (water  $76,3 \pm 0,29$ ; protein  $20,50 \pm 0,92$ ; fat  $2,2\% \pm 0,42$ ; ash  $1,1\% \pm 0,66$ ) (Perez Llamas et al., 1992).

The relatively high content of protein (20,94% in the first and 21,71% in the second group) found in the Musculus longissimus dorsi of kids, then the low percent of fat (0,6% in the first, 1,1% in the second group, respectively), as well as the favourably balanced ratio of protein and fat content is in agreement with the contemporary nutrient requirements (Riedel, 1984).

The analysis of the amino acids content in the MLD of kids of domestic white goat showed some differences in their content, depending on the feeding and housing of the animals. Thus, a somewhat higher content of essential amino acids was found in group I (7,79%) than in group II (7,16%) of animals. As far as the semi dispensable amino acids were concerned, the situation was opposite. Thus, group II contained 2,7% and group I 2,43% of semi dispensable amino acids. The content of total dispensable amino acids was somewhat higher in group II (9,39%) than in group I (8,49%).

Table 2. Amino acid composition of musculus longissimus dorsi of kids, expressed as%

Content	Group					
	I (n = 20)			II (n = 20)		
	$\bar{x}$	S	V	$\bar{x}$	S	V
<b>Indispensable:</b>						
Lysine	1,42	0,03	2,01	1,59	0,01	1,70
Threonine	0,88	0,02	2,41	0,92	0,01	1,30
Valine	1,19	0,03	2,74	0,97	0,01	1,05
Methionine	0,56	0,02	3,31	0,49	0,02	5,06
Isoleucine	0,95	0,01	1,39	0,58	0,02	2,96
Leucine	1,83	0,02	0,89	1,64	0,01	0,86
Phenylalanine	0,96	0,02	1,74	0,97	0,02	1,72
<b>Total indispensable</b>	<b>7,79</b>			<b>7,16</b>		
<b>Semidispendable:</b>						
Histidine	0,25	0,02	9,26	0,58	0,01	2,44
Arginine	1,46	0,01	1,01	1,43	0,02	1,74
Tyrosine	0,72	0,03	3,83	0,73	0,01	1,50
<b>Total semidispendable</b>	<b>2,43</b>			<b>2,74</b>		
<b>Dispensable</b>						
Serine	0,76	0,02	2,41	0,65	0,02	3,72
Proline	0,87	0,01	1,02	0,76	0,02	2,20
Glycine	1,24	0,02	1,49	1,27	0,02	1,95
Alanine	1,29	0,02	1,58	1,17	0,01	1,20
Cystine	—	—	—	—	—	—
Aspartic acid	1,32	0,02	1,21	1,89	0,01	0,62
Glutamic acid	3,01	0,03	1,06	3,65	0,02	0,60
<b>Total dispensable</b>	<b>8,49</b>			<b>9,38</b>		

Group I - backyard system of rearing kids (n= 20)

Group II - kids reared on the farm (n=20)

X - mean value of the content determined

S - standard deviation

V - coefficient of variation

The presence of all essential amino acids in the muscles of kids, their total level as well as that of semidispensable and dispensable amino acids contributes to the high biological value of that kind of meat (Hofmann, 1981; Rogowski, 1981).

Determination of the content of trace and macroelements in MLD of kids (Table 3), indicated certain differences between the groups investigated, but there was no general regularity. The individual elements (calcium, phosphorus, sodium, iron, zinc and manganese) were present in higher amounts in group I in relation to group II, contrary to the elements (potassium, magnesium, copper), which were higher in group II. Magnesium was found in the highest amount in the muscles examined (group I: 124,05 mg kg<sup>-1</sup>; group II: 153,60 mg kg<sup>-1</sup>), while copper was present at the lowest level (group I: 2,60 mg kg<sup>-1</sup>; group II: 3,70 mg kg<sup>-1</sup>).

Comparing the values of the calcium content (group I: 13,0 mg kg<sup>-1</sup>; group II: 3,00 mg kg<sup>-1</sup>) with those reported by Bosch, (1962) who obtained a calcium content of 77 mg kg<sup>-1</sup> for kid meat indicated considerable deviation. This could be explained by the difference of muscle tissues analysed.

The iron content in the muscles of I group amounted to 20,20 mg kg<sup>-1</sup>, and 18,00 mg kg<sup>-1</sup> in group II. The obtained results are in agreement with those of Bosch, (1962) and Rogowski, (1981).

Table 3. Content of trace and macroelements in musculus longissimus dorsi of kids expressed in mg kg<sup>-1</sup>

Group		Content								
		Ca	P	K	Na	Fe	Zn	Cu	Mn	Mg
I (n = 20)	x	13	23	15,2	7,3	20,20	22,25	2,60	4,40	124,05
	S	1,72	1,82	0,21	0,13	0,11	0,22	0,01	0,10	0,04
	V	7,94	1,40	1,82	0,24	0,99	0,54	2,20	2,40	0,04
II (n = 20)	x	9	19	18,4	6,3	18	19,20	3,70	2,40	153,60
	S	1,12	1,10	0,27	0,11	0,18	0,54	0,01	0,11	0,30
	V	12,53	5,82	1,46	1,74	0,48	2,82	4,50	4,50	0,20

Group I - backyard system of rearing kids (n = 20)

Group II - kids reared on the farm (n = 20)

X - mean value of the content determined

S - standard deviation

V - coefficient of variation

## CONCLUSION

The water content of samples of MLD from kids kept in backyards (group I) was 76,29% and from those of group II 75,78%. The protein content was 20,94 and 21,70% and fat 0,54% to 1,01% for group I and group II, respectively.

All essential amino acids were found in Musculus longissimus dorsi of kids.

The content of trace and macroelements is optimal, especially of iron (18,0 to 20,2 mg kg<sup>-1</sup>) and phosphorus (19 to 23 mg kg<sup>-1</sup>).

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## HIMIJSKI SASTAV MESA JARADI DOMAĆIH BELIH KOZA

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### SADRŽAJ

Izučavanjem kompleksne problematike definisanja kvaliteta mesa, u ovom radu je dat prikaz ispitivanja pojedinih nutritivnih svojstava jarećeg mesa.

Za ispitivanja su korišćena jarad rase domaća bela koza. Žrtvovanje oglednih životinja je izvršeno u starosti od 3,5 do 4 meseca. U ogledu su bile dve grupe jaradi. Prva, ogledna grupa ( $n = 20$ ) uzgajana je u slobodnom (privatnom) sistemu držanja. Jarad su bila na sisi do tri meseca starosti, uz mogućnost ishrane na zelenoj travi i povremeno dodavanje livadskog sena i kukuruzne prekrupе. Druga ogledna grupa ( $n = 20$ ) uzgojena je u farmskom sistemu držanja. Jarad iz ove grupe bila je na sisi do 20 dana starosti, uz privikavanje i prelazak na koncentrovani sistem ishrane. Obrok ove grupe se sastojao od kukuruzne prekrupе, prekrupе ječma, suncokretove sačme, "Kostovita" i "Premiksa". Pored ove koncentrovane hrane, jarad su dobijala i livadsko seno. Obe ogledne grupe su dobijale so po želji.

U uzorcima *Musculus longissimus dorsi* jaradi analiziran je osnovni hemijski sastav, aminokiselinski sastav, kao i sadržaj makroelemenata (kalcijum, fosfor, kalijum, natrijum) i mikroelemenata (gvožđe, cink, bakar, mangan i magnezijum).

Na osnovu izvršenih analiza može se zaključiti da sa nutritivnog aspekta meso jaradi domaćih belih koza predstavlja veoma kvalitetnu vrstu mesa. Bogato je proteinima, 20,94% do 21,70%. Sadrži sve potrebne esencijalne amino kiseline. Od mikro i makro elemenata treba istaći sadržaj gvožđa od 18,0 do 20,2 mg kg<sup>-1</sup>. Jareće meso sadrži izuzetno nizak procenat masti od svega 0.54 do 1.01 %.